

CLAIMS:

1. A semiconductor processing method of chemical vapor depositing  $\text{SiO}_2$  on a substrate comprising:

placing a substrate within a chemical vapor deposition reactor;

feeding an organic silicon precursor into the chemical vapor deposition reactor having the substrate positioned therein under conditions effective to decompose the precursor into  $\text{SiO}_2$  which deposits on the substrate and into a gaseous oxide of hydrogen; and

feeding an additional quantity of the gaseous oxide of hydrogen into the reactor while feeding the organic silicon precursor into the reactor.

2. The semiconductor processing method of claim 1, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from separate feed streams.

3. The semiconductor processing method of claim 1, wherein the organic silicon precursor and the additional quantity of the gaseous oxide of hydrogen are fed into the reactor from a common feed stream.

1           4.    The semiconductor processing method of claim 1, wherein  
2 the feeding steps collectively comprise:

3           mixing a quantity of the organic silicon precursor in liquid form  
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
5 mixture;

6           converting the liquid mixture to a gaseous mixture; and  
7           feeding the gaseous mixture into the reactor.

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9           5.    The semiconductor processing method of claim 1, wherein  
10 the feeding steps collectively comprise:

11           mixing a quantity of the organic silicon precursor in liquid form  
12 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
13 mixture, the quantity of the organic silicon precursor being greater by  
14 volume than the quantity of the oxide of hydrogen;

15           converting the liquid mixture to a gaseous mixture; and  
16           feeding the gaseous mixture into the reactor.

1 6. The semiconductor processing method of claim 1, wherein  
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form  
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
5 mixture, the quantity of the oxide of hydrogen comprising between about  
6 5%-15% of the liquid mixture volume;

7 converting the liquid mixture to a gaseous mixture; and  
8 feeding the gaseous mixture into the reactor.

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10 7. The semiconductor processing method of claim 1, wherein  
11 the feeding steps collectively comprise:

12 mixing a quantity of the organic silicon precursor in liquid form  
13 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
14 mixture;

15 converting the liquid mixture to a gaseous mixture, the converting  
16 step including heating the liquid mixture to a temperature of between  
17 about 65° C to 80° C; and

18 feeding the gaseous mixture into the reactor.  
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1 8. The semiconductor processing method of claim 1, wherein  
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form  
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
5 mixture, the quantity of the organic silicon precursor being greater by  
6 volume than the quantity of the oxide of hydrogen;

7 converting the liquid mixture to a gaseous mixture, the converting  
8 step including heating the liquid mixture to a temperature of between  
9 about 65° C to 80° C; and

10 feeding the gaseous mixture into the reactor.  
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12 9. The semiconductor processing method of claim 1, wherein  
13 the feeding steps collectively comprise:

14 mixing a quantity of the organic silicon precursor in liquid form  
15 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
16 mixture, the quantity of the oxide of hydrogen comprising between about  
17 5%-15% of the liquid mixture volume;

18 converting the liquid mixture to a gaseous mixture, the converting  
19 step including heating the liquid mixture to a temperature of between  
20 about 65° C to 80° C; and

21 feeding the gaseous mixture into the reactor.  
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10. The semiconductor processing method of claim 1 wherein the organic silicon precursor is selected from the group consisting of silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclotetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and fluorotrialkoxysilane (FTAS).

11. The semiconductor processing method of claim 1, wherein the chemical vapor deposition reactor is a hot wall reactor.

12. The semiconductor processing method of claim 1, wherein the chemical vapor deposition reactor is a cold wall reactor.

13. A semiconductor processing method of reducing the decomposition rate of an organic silicon precursor in a chemical vapor deposition process of depositing  $\text{SiO}_2$  on a substrate within a chemical vapor deposition reactor comprising feeding at least one of  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$  into the reactor while feeding the organic silicon precursor.

14. The semiconductor processing method of claim 13, wherein the at least one of  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$  is fed into the reactor separately from the organic silicon precursor.

1 15. The semiconductor processing method of claim 13, wherein  
2 the at least one of  $H_2O$  and  $H_2O_2$  is injected into the reactor  
3 separately from the organic silicon precursor, and comprises less than  
4 about 50% by volume of material injected into the reactor.

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6 16. The semiconductor processing method of claim 13, wherein  
7 the at least one of  $H_2O$  and  $H_2O_2$  is injected into the reactor  
8 separately from the organic silicon precursor, and comprises between  
9 about 5% to 15% by volume of material injected into the reactor.

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11 17. The semiconductor processing method of claim 13, wherein  
12 the at least one of  $H_2O$  and  $H_2O_2$  is injected into the reactor  
13 separately from the organic silicon precursor, and comprises less than  
14 about 5% by volume of material injected into the reactor.

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16 18. The semiconductor processing method of claim 13, wherein  
17 the feeding steps collectively comprise:

18 mixing a quantity of the organic silicon precursor in liquid form  
19 and a quantity of the at least one of  $H_2O$  and  $H_2O_2$  in liquid form  
20 to form a liquid mixture;

21 converting the liquid mixture to a gaseous mixture; and  
22 feeding the gaseous mixture into the reactor.  
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1 19. The semiconductor processing method of claim 13, wherein  
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form  
4 and a quantity of the at least one of  $H_2O$  and  $H_2O_2$  in liquid form  
5 to form a liquid mixture, the liquid mixture comprising no less than  
6 about 0.5% by volume of the at least one of  $H_2O$  and  $H_2O_2$ ;

7 converting the liquid mixture to a gaseous mixture; and  
8 feeding the gaseous mixture into the reactor.

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10 20. The semiconductor processing method of claim 13, wherein  
11 the feeding steps collectively comprise:

12 mixing a quantity of the organic silicon precursor in liquid form  
13 and a quantity of the at least one of  $H_2O$  and  $H_2O_2$  in liquid form  
14 to form a liquid mixture, the liquid mixture comprising between about  
15 5% to 15% by volume of the at least one of  $H_2O$  and  $H_2O_2$ ;

16 converting the liquid mixture to a gaseous mixture; and  
17 feeding the gaseous mixture into the reactor.

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19 21. The semiconductor processing method of claim 13, wherein  
20 the organic silicon precursor is selected from the group consisting of  
21 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-  
22 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and  
23 fluorotrialkoxysilane (FTAS).  
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1 22. The semiconductor processing method of claim 13, wherein  
2 the chemical vapor deposition reactor is a hot wall reactor.  
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4 23. The semiconductor processing method of claim 13, wherein  
5 the chemical vapor deposition reactor is a cold wall reactor.  
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7 24. A semiconductor processing method of chemical vapor  
8 depositing  $\text{SiO}_2$  on a substrate comprising:

9 placing a substrate within a chemical vapor deposition reactor; and  
10 feeding an organic silicon precursor and feeding an oxide of  
11 hydrogen into the chemical vapor deposition reactor having the substrate  
12 positioned therein under conditions effective to deposit an  $\text{SiO}_2$  layer  
13 on the substrate.  
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1 25. The semiconductor processing method of claim 24, wherein  
2 the feeding steps collectively comprise:

3 mixing a quantity of the organic silicon precursor in liquid form  
4 and a quantity of the oxide of hydrogen in liquid form to form a liquid  
5 mixture, the liquid mixture comprising less than about 15% by volume  
6 of the oxide of hydrogen;

7 heating the liquid mixture to a temperature sufficient to produce  
8 a gas containing at least some organic silicon precursor and at least  
9 some oxide of hydrogen; and

10 feeding the produced gas into the reactor.  
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12 26. The semiconductor processing method of claim 24, wherein  
13 the volume of material injected into the reactor has no more than  
14 about 15% by volume of the oxide of hydrogen.  
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16 27. The semiconductor processing method of claim 24, wherein  
17 the volume of material injected into the reactor has between about 5%  
18 to 15% by volume of the oxide of hydrogen.  
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20 28. The semiconductor processing method of claim 24, wherein  
21 the volume of material injected into the reactor has between about  
22 0.5% to 5% by volume of the oxide of hydrogen.  
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1 29. The semiconductor processing method of claim 24, wherein  
2 the organic silicon precursor is selected from the group consisting of:  
3 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-  
4 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and  
5 fluorotrialkoxysilane (FTAS).  
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7 30. The semiconductor processing method of claim 24, wherein  
8 the chemical vapor deposition reactor is a hot wall reactor.  
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10 31. The semiconductor processing method of claim 24, wherein  
11 the chemical vapor deposition reactor is a cold wall reactor.  
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13 32. A semiconductor processing method of reducing the  
14 formation of undesired reaction intermediates in a chemical vapor  
15 deposition decomposition reaction of an organic silicon precursor into  
16 silicon dioxide within a chemical vapor deposition reactor comprising  
17 feeding at least one of  $H_2O$  and  $H_2O_2$  into the reactor with the  
18 organic silicon precursor.  
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20 33. The semiconductor processing method of claim 32 wherein  
21 the at least one of  $H_2O$  and  $H_2O_2$  is fed into the reactor separately  
22 from the organic silicon precursor.  
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1           34. The semiconductor processing method of claim 32 wherein  
2 the at least one of  $H_2O$  and  $H_2O_2$  is first combined with the organic  
3 silicon precursor, and then fed into the reactor with the organic silicon  
4 precursor.

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6           35. The semiconductor processing method of claim 32, wherein  
7 the organic silicon precursor is selected from the group consisting of:  
8 silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-  
9 tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and  
10 fluorotrialkoxysilane (FTAS).

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12           36. The semiconductor processing method of claim 32, wherein  
13 the chemical vapor deposition reactor is a hot wall reactor.

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15           37. The semiconductor processing method of claim 32, wherein  
16 the chemical vapor deposition reactor is a cold hot reactor.

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38. A semiconductor processing method of chemical vapor depositing  $\text{SiO}_2$  on a substrate comprising:

placing a substrate within a chemical vapor deposition reactor;

mixing a quantity of an organic silicon precursor in liquid form and a quantity of an oxide of hydrogen in liquid form to form a liquid mixture, the organic silicon precursor being selected from the group consisting of: silane, tetraethoxysilane (TEOS), diethylsilane (DES), tetramethylcyclo-tetrasiloxane (TMCTS), fluorotriethoxysilane (FTES), and fluorotrialkoxysilane (FTAS), the oxide of hydrogen being selected from the group consisting of:  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$ , the quantity of the oxide of hydrogen comprising between about 5%-15% of the liquid mixture volume;

converting the liquid mixture to a gaseous mixture by heating the liquid mixture to a temperature of between about  $65^\circ\text{C}$  to  $80^\circ\text{C}$ ; and

feeding the gaseous mixture into the reactor.